

SCIENCE

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FRIDAY, JUNE 26, 1896.

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FISHES, LIVING AND FOSSIL.

A TEXT-BOOK of Ichthyology embodying the results of recent investigation and taking cognizance of both living and extinct forms has long been a desideratum. Dr. Günther's 'Introduction to the Study of Fishes' (1880) did not at all represent the condition of ichthyology even at the time of its original publication, and the German translation (1886) was scarcely more than a reproduction, in another language, of the original work and retained almost all its numerous defects and errors. Those defects and errors were especially manifest in the treatment of the extinct forms. The increase in our knowledge of past types, too, has been very great within the last decade, owing to the labors of Mr. Smith Woodward, Prof. Cope and others. The desideratum indicated, to a certain limited extent, has been supplied so far as the 'fossil' fishes are concerned, in a recent work, by Dr. Dean, of New York, entitled 'Fishes, Living and Fossil.*' But it is not, as the author confesses, an elaborate introduction to ichthyology; its 'object is to enable the reader to obtain a convenient review of the most important forms of fishes and of their structural and developmental characters'

* *Fishes, Living and Fossil*. An outline of their forms and probable relationships. By Bashford Dean, Ph. D., Instructor in Biology, Columbia College, New York City.—New York: Macmillan & Co. 1895. (Columbia University Biological Series III.—8vo, xiv, 300 pp.)

(p. ix). A brief summary of the chapters will enable the student to judge of the extent and scope of the work.

In the first chapter, after the 'introductory, the form and movement of fishes, their classification, geological distribution, mode of evolution, [and] the survival of generalized forms' are considered (pp. 1-13).

In the second chapter, 'the evolution of structures characteristic of fishes, *e. g.* (1) gills, (2) skin defences, (3) fins, and (4) sense organs' are discussed (pp. 14-56).

In the third chapter, 'the Lampreys and their allies,' including 'the Ostracoderms and Palæospondylus,' are described (pp. 57-71).

In the fourth chapter (pp. 72-98), 'the Sharks,' in the fifth (pp. 99-115) 'the Chimaeroids,' in the sixth (pp. 116-138) 'the Lung-fishes' or Dipnoans, and in the seventh (pp. 139-178) 'the Teleostomes (*i. e.*, Ganoids and Teleosts)' are briefly noticed.

In the eighth chapter (pp. 179-226) we are presented with sketches of 'the groups of fishes contrasted from the standpoint of embryology, their eggs and breeding habits, outlines of the development of Lamprey, Shark, Lung-fish, Ganoid and Teleost, [and] their larval development.'

Next are furnished unnumbered sections, giving 'derivation of names' (p. 227-230), 'bibliography' (p. 231-251), and 'explanatory tables' (V.-XIX.) continued (p. 252-283) from others given elsewhere (p. 8, 9, 98, 166) in the volume, which is capped with a full index (p. 285-300).

Fish is a word of diversiform meanings; it is the expression of a concrete notion and it is the symbol of an abstract concept; in the former sense it brings before the mind a vertebrate inhabitant of the water with a subfusiform body, and in the latter sense any inhabitant of the water as contrasted with one of the air or of the land; when it is used in such compounds as fish-form,

fish-like, fish-shaped, fish-backed and fish-bellied, it is the typical fusiform fish that is meant; when shell-fish, star-fish and jelly-fish are named it is the abstract concept of inhabitants of the water that is imagined. In the latter sense it is a reminiscence of the time when men believed in the 'elements' of earth, water and air, and apportioned to each their inhabitants. Those inhabitants were designated by Plato as *ξηροτροφικά*, *ὕδροτροφικά*, and *ξηρονομικά*. In the cosmological dreams of elders of our 'Aryan' stock as well as the Semitic they were created specially for the elements in question; so imagined the Hebrew historians, and to like purpose did Ovid sing.

Dr. Dean well remarks that "it would be unreasonable to doubt that the fish form is adapted to the mechanical needs of its environment" (p. 6). Such adaptation is evident. Nature has evolved and developed the form; man has copied. The 'fish form,' in its perfection, is realized in the tunnies and other wanderers of the high seas. The forms whose movements are delineated (p. 2) after Marey are not of this class, but a stage or more removed from it. The typical fish can only describe simple curves; the shark with its sigmoid curve and the eel with its multiplex curve introduce other conditions. On the other hand, it is the typical and sub-typical fish forms that have been the subjects of Mr. Parson's memoir on 'the displacement and the area curves of fish'* and have furnished the four outlines copied by Dr. Dean (p. 5).

The typical fish form, as exemplified in the tunnies, is especially adapted for rapidity of locomotion, and all the fishes in which it is developed are preëminently coursers of the sea. But it is not alone by coursing that fishes obtain their daily food. To obtain that food, to secure safety and concealment, Nature has provided many devices

* Trans. Am. Soc. Mech. Engineers Vol. IX., pp. 679-695, with 7 pl. incl. 21 contours.

and innumerable deviations from the typical fish form are developed.

But, as Dr. Dean well observes, the fish form 'is a factor in the evolution of fishes which appears in [almost] every [large] group and subgroup. And it has ever stood in the way of classifying them satisfactorily according to their kinships' (p. 7). Still more aggressive as obstacles have been certain deviations from that form and especially the eel-like form. The anguilliform modification, resulting from elongation of the body and concomitant adjustments, such as union of the vertical fins, loss of the ventrals, and restriction of the branchial apertures, is apt to recur in various groups, and does occur in the plectospondylous 'eels' ('electrical eel,' etc.) and the symbranchoid to such a degree that it has been difficult even for ichthyologists to convince themselves that the likeness was deceptive as indication of affinity.

The progress of ichthyology has been in a ratio inverse to the influence on the mind of this ancient concept of the importance of adaptation of the organization for aquatic life. Many are still influenced by it. As a consequence all the branchiferous vertebrates are confounded in one class—the Fishes or Pisces. By most morphologists, however, that physiological group is subdivided into three or more classes. Three are admitted by Dr. Dean—the Leptocardians, the Marsipobranchs, and the true Fishes or Pisces. The last two are arranged in the following table (p. 8):

A CLASSIFICATION OF FISHES.

Type: CHORDATA (VERTEBRATES).

Class: MARSIPOBRANCHII, Lampreys, *Palæospondylus*, Hag, Lamprey, *Ostracoderms*.

Class: PISCES (TRUE FISHES).

I. Sub-class: ELASMOBRANCHII, Sharks and Rays.

Order: *Pleuropterygii* (Dean), *Cladoselachids* (Dean).

" *Ichthyotomi* (Cope), *Pleuracanthids*.

" *Selachii*, Sharks and Rays.

II. Sub-class: HOLOCEPHALI, Chimæroids, Spook-fishes.

Order: Chimæroidei, *Squaloraiids*, *Myriacanthids*, Chimæroids.

III. Sub-class: DIPNOI, Lung-fishes.

Order: Sirenoidei, *Dipterids*, *Phaneropleurids*, *Ctenodonts*, *Lepidosirenids*.

" ? *Arthrodira*, *Coccosteids*, *Mylostomids*.

IV. Sub-class: TELEOSTOMI, Ganoids and Bony Fishes (Teleosts).

Order: *Crossopterygii*, *Holoptychiids*, *Osteolepids*, *Onychodonts*, *Cælacanthids*.

" *Actinopterygii*.

Sub-order: Chondrostei (Ganoids), *Palæoniscoids*, Sturgeons, Garpikes, Amioids.

" Teleocephali, recent Bony Fishes (Teleosts).

In this table Dr. Dean claims to have 'retained in the main the classification of Smith Woodward,' but he has adopted the most prominent features from Prof. Cope. It expresses, too, the ideas of most morphologists, but it is questionable whether Dr. Dean has gone far enough in the valuation of some groups. The reviewer would be inclined to admit four classes exclusive of the Leptocardians.

The 'Marsipobranchii' might be split into two classes—the Marsipobranchii (properly classed) and the Ostracophori or 'Ostracoderms' as Dr. Dean calls them. The latter are very imperfectly unknown, and only by Prof. Cope had they been previously associated in the same class as the Marsipobranchs. By Woodward they were ranked as a special subclass of true fishes. The evidence for any allocation is defective but for the present the group may be given class rank and retain the name Ostracophori. It was originally named Ostracodermi, but that name having been preoccupied (in 1872) by Gill for the Ostraciids, the new name was later given by Cope. But although first distinguished as a subclass under the name Ostracodermi, the differences between the representatives of that subclass and the Arthrodira had been to a

considerable degree appreciated twenty years ago. The reviewer, in the article 'Ichthyology' in Johnson's *Universal Cyclopædia* (II., 1876) then gave the following arrangement of the extinct types:

'Super-order Dipnoi.'

'Order Sirenoidei.

'(?) Order Placoganoidei* (extinct).

'Super-order (?) Aspidoganoidei (extinct).

'Order Cephalaspidoidea (extinct).'

The 'Elasmobranchs' of Dean and Chimæroids have been segregated in another class named Selachians or Elasmobranchs, and the two main groups have been regarded as sub-classes—Plagiostomes and Holocephals.

The Dipnoans and the Teleostomes are scarcely separable as classes, although often kept apart as such. The Dipnoans and Crossopterygians lose some of their salient characters, as we follow them back in time, and have evidently diverged from a common stock. For the united group the class name Pisces, or Teleostomi, can be used.

Such are the opinions of the reviewer, but perhaps Dr. Dean acted wisely in accepting the classification adopted. The succeeding pages teem with statements challenging attention and often perhaps dissent. In almost all cases, however, weighty evidence could be urged in favor of the views adopted. There are few cases where we feel disposed to bring forward objections, but a comparison of ideas on some mooted questions may be of interest and use.

The 'explanatory tables' towards the end of the volume give facts respecting the 'skeletons of fishes' (pp. 252, 253), 'relations of the jaws and branchial arches of fishes' (pp. 256, 257), 'the heart of fishes' (260), 'a comparison of gills, spiracle, gill-rakers and opercula' (260, 261), 'digestive tract' (263), 'swim-blad-

der' (264), 'genital system' (266), 'circulation of fishes' (269), 'excretory system and urinogenital ducts' (270, 271), 'abdominal pores' (271), 'the central nervous system of fishes' (274, 275), 'the sense organs' (276, 277), etc.

These tables give a large amount of useful and tolerably well digested information illustrated by apt figures and arranged under the main groups of fish-like vertebrates, as Cyclostomes, Sharks, Chimæroids, Lung-fishes, Ganoids and Teleosts. But useful as the tables are, the ordinary reader will be liable to fall often into error if he allows himself to trust them too implicitly. The exceptions to the general propositions are very numerous. Examples of such are 'tail heterocercal' (p. 252) in Selachians, or 'Sharks' and Rays, 'operculum, pre-, sub- and inter-opercula,' in Teleosts, etc. (261), 'many pyloric cæca' in Teleosts (263), and air bladder in Teleosts as in Sturgeon (264) but 'may be absent (Pleuronectids).' Hosts of the fishes respecting which the characters in question are predicated differ from the majority in wanting them. The remarkably aberrant Lyomeres, indeed, want all.

The anatomical portion is generally satisfactory, so far as it goes, and, although we may sometimes differ from the author as to homologies, he seldom falls into absolute error, as he does, for example, in calling the ventral fins of *Ophidium* 'barbels' (p. 47). He may be congratulated on having divested himself of 'his former view that the pineal foramen of *Dinichthys* contained a specialized optic capsule' (55) and of a corresponding view respecting the 'pineal foramen' of Siluroids. Apropos of the Siluroids, we feel disposed to dissent from Dr. Dean's statement respecting 'the most complete encasement of a fish's body dermal plates' as manifest in callichthyids. He thinks that the two lateral rows of plates are the result of 'extended fusions, a single

* Placoganoidei was an ordinal name for the Placodermi with dipnoan dentition.

dermal plate enclosing the upper or lower division of the muscle plate of either side' (p. 26). It is not evident what reason he has for such a belief, and why the extension of single plates is not more probable; equally improbable is the explanation of the size of the 'dermal plates of the Seahorse' resulting from 'fusions' (p. 26). As a rule, enlarged scales result from individual extension, and not general aggregation. The mode is suggested by the varieties of carp alluded to by Dr. Dean (p. 26).

A short chapter on 'the development of fishes' is given, and, on the whole, the subject is well brought up to date. Dr. Dean thinks that the data of embryology are 'very inconclusive' with reference to the successively increasing complication of structure, if at present in any way suggestive (p. 180). This is certainly the case if reference is had only to external features. 'Adaptive characters have entered so largely into the plan of the development of fishes that they obscure many of the features which might otherwise be made of value for comparison' (p. 180). Such being the case, we have no right to expect very much from superficial characters. It is the study of the anatomy, and especially of the developing bones, that will ultimately give useful hints. Indeed, only from a survey of the detailed comparative anatomy of the successive stages of the developing fishes have we a right to look for light on some questions of relationship and phylogeny. For instance, we should not expect much more guidance from mere externals of the various stages of '*Ceratodus*' than the illustrations actually give. Here it may be added that we are indebted to Dr. Dean for giving the results of such very recent work as that of Semon.

The nomenclature of Dr. Dean's work is mostly in accord with current American usage, so far as the American species at least are concerned, but sometimes that cur-

rent in Europe is adapted, as *Bdellostoma* (61) instead of *Heptatrema*, *Cestracion* (85), for *Heterodontus*, *Lemargus* (91) for *Somniosus*, *Rhina* (91) for *Squatina*, '*Butrinus*' (258, 260, *Butirinus*) for *Albula*, etc. Sometimes there is a discrepancy resulting, perhaps, from the fact that the author may not have been fully aware that his names referred to the same form as *Squalus* (89) and *Acanthias* (216).

The numerous (344) figures are generally well selected and illustrate morphological and other data. Some, however, as most derived from Agassiz's and Pander's works and that of *Pleuracanthus* (90), might have been supplanted by later and better ones. A few, also, have been misplaced or misnamed, as 29, which really represents *Aetobatus* and not *Trygon*; 172 depicting *Bathyonus compressus*; 173 representing *Notacanthus sexspinis*; 174 representing *Paraliparis bathybius*, and 182 illustrating *Microgadus tomcodus* and not *Gadus morrhua*.

The most serious omission in the 'Fishes, living and fossil,' is of most of the living forms. Somewhere near 10,000 of those are Teleosts, and only about 350 living species belong to the other divisions. Nevertheless the systematic consideration of the Teleosts is condensed within 13 pages (165-178), and no idea is given of the range of variation and the diversity of that large group. The Cyprinoideans, the Characinoideans, the Cichloideans and the Percoidae, which constitute so large an element of fresh-water fishes, are not even mentioned as such. In the tables of 'classification' and 'distribution * * * in geological time' (pp. 8, 9) only six groups (Teleocephali, Clupeoids, Salmonids, Perches and Berycids, Siluroids, and 'Gadoids and other Teleosts') are named. Surely the student would reasonably expect to find more in a work entitled as it is.

Mention having been made of the 'Teleocephali,' it may be added that the group

so called is by no means identical with the Teleosts, as stated (pp. 8, 165). The Telecephali are an order of the sub-class of Teleosts restricted to such as have typically complete intermaxillary and maxillary bones and cranial in number exemplified or closely approximated by the Perch; it thus contrasts with the Nematognathi, the Apodes, and others.

The Nematognaths are considered by Dr. Dean, as by most old authors, to be 'closely akin to the Sturgeon' (p. 147), and, indeed, it is claimed that the Catfish 'is, perhaps, a direct descendant of some early type of Mesozoic Palæoniscoid' (p. 171). The same idea is also expressed in the exhibit of 'the phylogeny of the Teleostomes' (p. 166), where the 'Siluroid' branch is interposed between the 'Sturgeon' and 'Amia' and well separated from the 'Physostome.' It is likewise declared that 'their armouring is metamerical and archaic, their sensory canals primitive in structure and arrangement' (p. 172). All this may be quite in accord with what has been believed by the most learned ichthyologists of old, but can be now known to be baseless. The Siluroids have no direct relations with the Sturgeons, the Coccosteids, or any of the extinct ganoid fishes, and are undoubtedly derivatives from the same stock as the Characinids and the Cyprinids. The armature, instead of being archaic, is of secondary development. The fishes themselves are more specialized and therefore more distant from the Ganoids than the Characinids and various other forms. The entire structure, including brain, vascular system, skeleton, weberian ossicles, air bladder, and morphological development generally, proves this and in turn is illustrated by this conception of their relationship. The similarity in appearance of Loricariids and Acipenserids, great as it is, is entirely superficial and illusive and should no longer be allowed to mislead. While referring to

the Siluroids, it may be added that there is more than a 'single European species, *Silurus glanis*' (p. 171). There is another concerning which many data were published over 2200 years ago—the true Glanis of the Greeks and of Aristotle especially, the *Silurus*, or *Parasilurus Aristotelis*. Although this Greek fish has generally been supposed to be identical with 'the gigantic Wels of the Danube,' it was, as declared by Agassiz 40 years ago, and demonstrated lately by Mr. Garman, a very different species.

Dr. Dean's misconceptions respecting the Siluroids are those of others. He declines to go to the extremes of some others, and very properly notes (p. 64) disbelief in the 'cirrhostomial origin [ascribed] to the mouth parts of a Teleostome (catfish).'

Some of the statements as to distribution and extent of groups may mislead. Of the Mormyrids, or genus *Mormyrus* as Dr. Dean calls the group, it is said, 'its species are restricted to the Nile' (p. 172), whereas species occur in all the rivers of tropical Africa. Of the *Anacanthini*, it is claimed 'that as many, perhaps, as one-quarter of the existing genera of fishes may be assigned to this type' (p. 174): in fact, the *Anacanthini* are comparatively few in number, especially if properly restricted. It is also said that 'of existing fishes about one-half are essentially percoid' (p. 174) and this also is a very much exaggerated statement.

The care which Dr. Dean has taken to bring his work up to date has already been adverted to in connection with Semon's researches on the embryology of *Neoceratodus*. Another example is found in the incorporation of the latest news about the earliest 'cyclostome.' References to recent memoirs (1890-92) on that interesting form are given (p. 238), and an illustration is reproduced (p. 65). We can scarcely agree with Dr. Dean, however, that it 'seems undoubtedly a lamprey;' apparently it represents not

only a peculiar family (*Palæospondylidae*), but a distinct order which may be called CYCLLÆ.

Only one other feature of Dr. Dean's work can be noticed. The volume is gracefully introduced and its scope indicated in the words of Aristotle—"Τῶν δ' ἐνύδρων ζώων τὸ τῶν ἰχθύων γένος ἐν ἀπὸ τῶν ἄλλων ἀφώρισται" *—and it is supplemented with a 'list of derivations of proper names.' There is, however, evidence of misconception of many etymologies, and corrected forms are here given of some of the names, leaving aside those that are substantially correct. Nevertheless it may be well to remark that the author need not have added adjective terminations for such words as 'fin(ned),' 'tail(ed),' 'tooth(ed),' 'bone(d),' 'spine(d),' and the like; they were correct without those endings and perfectly in harmony with such English words as Redfin, Hardtail, Fantail, Dogtooth (*Dentalium*), Greenbone, Porcupine and Spineback and such ancient Greek names as δασύπους, περχρόπτερος, ἰππουρος, μελάνουρος, and σινόδων. It is in this way that men naturally frame new names for such subjects.

The means for ascertaining or confirming the etymologies of many scientific names are, perhaps, not available for all who might desire to ascertain them, and they are often wrongly analyzed. To aid such inquirers is the aim of the following lines. If a scholarly man like Dr. Dean has found so many obstacles to correct information, less accomplished men must find the way still more difficult.

Acipenser is not from 'ἀκρήσιος, classic name of Sturgeon,' but is the old Latin name itself; both names were in use. According to Athenæus (VII., 44), "the accipensius, the same as the acipenser, or sturio, is but a small fish in comparison, and has a longer

nose, and is more triangular than the galeos in his shape."

Alopias is not, of course, a transliteration of 'ἀλωπεξίας, classic name of the fox shark,' and the name has been replaced with *Alopecias* by many zoölogists (Müller and Henle, 1838,* Richardson, Günther, and various text-books). There is, however, no reason why the veriest purists should not accept *Alopias*. Rafinesque might have preferred to make the name directly from ἀλωπός (=ἀλώπηξ) and the terminal element ίας (in analogy with ἀλωπόχρους, fox-colored) and had a perfect right to do so.

Amia, it is too true, was misnamed after 'ἀμία, classic name of tunny (?)', but, although a tunny, the ἀμία was not the tunny. There can be no doubt as to what the ancients meant by ἀμία, and the old name was correctly referred nearly three centuries and a-half ago by Rondelet, while the correctness of the identification was confirmed by the most scholarly of later ichthyologists (Cuvier). Nevertheless, the fact appears to have been frequently forgotten of late and, therefore, reiteration with additional evidence will not be superfluous. The ἀμία was unquestionably the bonito of the books at least—the *Sarda sarda* of scientific nomenclature. Only this could have been the tunny-like form which had strong teeth which it could use successfully against sharks and in cutting the ropes of nets,† and which had a gall bladder stretched out upon the intestines and equal to them in length.‡

It was the bonito which, according to Archestratus.

"Towards the end of autumn, when the Pleiad

"Has hidden its light ——"

Was in season;

"—— then dress the amia

*The quotation from Aristotle occurs in the first paragraph of the ninth chapter of the second book of most editions of the *Περί ζώων ιστορία*.

*Müller and Henle subsequently adopted *Alopias*.

†Aristotle, IX., xxv., 5.

‡Aristotle, II., xi., 7.

"Whatever way you please——"

"For then you cannot spoil it if you wish."

It was the bonito which Epicharmus sang when he provided for the festive board

"—— large plump amiaë

"A noble pair i' the middle of the table:"

The etymology of ἀμία itself was given by Aristotle, according to Athenæus; the species was called *Amia* from its going in shoals with companions of the same kind.*

Amiurus is from ἀ, privative, and μείουρος, curtailed, and not from "ἀμία, *Amia*, οὐρά tail(ed)."

Ammocetes is not derived from 'ἄμμος, sand, κοίτη (a bed),' which would mean sand bed, but from ἄμμος, sand, and κοττος [κοίτη does not have the double meaning '(a bed) abider.']. What might have been intended, was sand abider—ἄμμος and οἰκητής—which should have been rendered *ammæcetes*, and *ammocetes* would then have been a simple case of metathesis. (The same lapsus, but in an aggravated form, is seen in the case of two well-known genera of birds—*Pediocætes* and *Poocætes*.) But unfortunately for the hypothesis Dumeril sanctioned and adopted the name *Ammocætes* and the etymology from ἄμμος and κοίτος, 'séjour, cubile.'

Arthrodira is composed of ἄρθρον, joint and δειρή, neck (not 'δῖς, double'), and is so called on account of the joint-like connections between the head and body armature.

Belonorrhynchus is framed directly from βελόνη, a point or needle (not 'classic name of garfish'), and ῥύγχος snout. The ancient greek βελόνη was undoubtedly the pipefish, but the name in recent time has been perverted to the garfish.

Calamoichthys is from χάλαμος (rather than lat. 'calamus'), reed, and ἰχθύς, fish; *Calamichthys* would have been preferable

* παρὰ τὸ ἅμα ἵεναι ταῖς παραπλησίαις. Athenæus, VII., 6.

because shorter, and accord with classic words, such as χαλαμ-αύλης, etc.

Carassius is a latinized form of Karass, or Karausche, the German name of the *C. carassius*; not from 'χάραξ, classic name of (sea) fish.'

Cestracion is not from 'χέστρα,* classic name of (pavement-toothed) sea fish,' but from χέστρα, a broad-headed poleax (or 'malleus, malleator,' according to Klein). Klein applied the name to the hammer-headed sharks, and it was first misapplied by Cuvier to the genus previously named *Heterodontus* by de Blainville. The fish named χέστρα by the Greeks was better known as the *Sphyræna*.

Chlamydoselachus was the original and proper form of the genus called *Chlamydoselache*. Σελάχη is the plural form and therefore improper; σέλαχος is the singular. Probably Dr. Dean was misled by Dr. Günther, who changed it to *Chlamydoselache*, and he was probably misled by Cuvier, who gave the name *Selache* to the basking shark.

Cladoselache should have been called *Cladoselachus*.

Coccosteus is from κόκκος, berry (not 'κόκκος, rough like a berry') and ὀστέον, bone.

Cyclostomata is a compound of 'κύκλος,' circle, (not 'circular'), and the plural of 'στόμα, mouth.'

Dipnoi is not from 'δίπνοος, double breathing,' but δίπνοος, with two breathing apertures. The word occurs in Galen.

Erythrinus is not directly from 'ἐρυθρός, red-colored,' but from ἐρυθρίνος, the old Greek name of the *Pagellus erythrinus*, and was misapplied to the American genus in sequence of a vicious habit which Linnæus

* κέστρα, in the old editions of Liddell and Scott's 'Greek-English Lexicon' (e. g., 1864, p. 755), is defined 'a fish held in esteem among the Greeks, doubtful whether a pike or a conger, Epich. p. 36, Ar. Nub. 339;' it is properly defined in later editions (e. g., 1883).

and some others cultivated of using classical names for forms entirely unlike those for which the names were originally used.

Fierasfer, according to Cuvier, was the name current at Marseilles of the type species; therefore the 'derivation of Cuvier [was not] uncertain, perhaps, from proper name.'

Gadus is not 'the classic name of the cod,' which was practically unknown to the Greeks and Romans. The name does not occur in Aristotle, but in Athenæus (VII., 99), the words 'the ὄνος, which some call γάδος,' are quoted from Dorion. The name *Onos* seems to have been used in ancient Greece for the *Micromesistius poutassou* (*Gadus poutassou* of Risso), which now is called, in Greece, *Gaidouropsaron* (donkey-fish), or *Tsiplaki*. *Gadus* was first used as a generic name for the Gadids by Artedi, and subsequently limited, by exclusion of others and by definition, to the common cod and its congeners.

Ganoid is from γάνος, brightness, lustre, and εἶδος, appearance; not 'γάνος, enamelled.'

Hyperotreta (not *Hyperotretia*) is the better name of the order in question.

Ichthyotomi refers not 'to the distinctness of this group,' but to the alleged segmentation of the skull.

Æmargus was not the 'classic name of a shark,' but derived from λαίμαργος, gluttonous. The name was applied by Müller and Henle to the genus previously called *Somniosus* on account of the character given by Scoresey to the type species.

Lepidosiren is from λεπίς, scale, and Siren, the name given by Linnæus to an eel-shaped amphibian, not a 'salamander.'

Ophidium is the Linnæan improvement of *Ophidion* of Pliny (XXXII., 35, 53); not ὀφίδιον, a snake.

Ostracoderm is simply the English form of ὀστρακζύδερμος, hard skinned, from ὀστραζον (not ὀστράζον), shell, and δέρμα, skin.

Protopterus is from πρῶτος, first or primitive (not 'ancient'), and πτερόν, fin.

Scomberomorus is from σκόμβρος, mackerel, and ὄμορος, neighbor, and not 'μόριον, part.'

Selachii is a new Latin equivalent of σελάχη (plural of σέλαχος), cartilaginous fishes generally,* and not 'σελάχη, shark.'

Teleocephali is from τέλειος, complete, and κεφαλή, head; not 'τέλειος, entirely, ὁστέον, bone, κεφαλή, head.' The cephalic bones are not reduced in number or proportions as in the Nematognaths and Apodals.

Teleostomi from τέλειος, complete, and στόμα, mouth; not 'τέλειος, entirely, ὁστέον, bone, στόμα, mouth.' Intermaxillaries and supra-maxillaries are normally developed.

Other names whose etymologies require more or less emendation or explanation are *Ammocætes*, *Anacanthini*, *Anguilla*, *Callichthys*, *Callorhynchus*, *Chimæra*, *Climatius*, *Crossopterygii*, *Dipterus*, *Elonichthys*, *Gyroptychius*, *Harriotta*, *Hemitripterus*, *Heptanchus*, *Hippocampus*, *Holoptychius*, *Ischyodus*, *Lamna*, *Mormyrus*, *Myliobatis*, *Mylostoma*, *Myriacanthus*, *Myxine*, *Palæoniscus*, *Parexus*, *Perca*, *Petromyzon*, *Phaneropleuron*, *Plectognathi*, *Pleuracanthus*, *Pogonias*, *Pristiophorus*, *Pristis*, *Protopterus*, *Pseudopleuronectes*, *Pterichthys*, *Raja*, *Rhabdolepis*, *Rhina*, *Rhinobatus*, *Scaphirhynchus*, *Scyllium*, *Silurus*, *Sirenoidei*, *Squalus*, *Squatina*, *Torpedo*, *Trachosteus* and *Trygon*. Interesting questions are involved in some of these names, but our already overcrowded space forbids lingering over any one of them.

The length to which this review has extended must be evidence of the importance of Dr. Dean's work. The suggestions here offered may be of use for another edition. That another may be called for, we may hope. For the work as it is and for the care and thought bestowed on it our thanks are due.

THEO. GILL.

*The Σελάχη are those which have been mentioned [βάτος, πρυγάν, ρίννη]; and the βοῦς, λάμια, αἰετός, νάρκη, βάτραχος, and all the γαλεῶδη' (Aristotle, V., iv, 2.) In other words, the Selache include all the Sharks, all the Rays, and the acanthopterygian *Lophius*.

FOOD OF THE EUROPEAN ROOK (*CORVUS FRUGILEGUS*).

AN interesting paper upon the food of the Rook, by Dr. Hollrung, appears in the Seventh Annual Report of the Experiment Station at Halle,* and furnishes some points for comparison with the food of our allied species of American birds.

The following is a list of the principal contents of 131 stomachs of rooks killed in April, May and June:

48 larvæ of <i>Zabrus</i>	22 <i>Tanymericus</i> .
	(Weevils).
<i>gibbus</i> .	Snails.
20 wire worms	Mice.
(<i>Elaterid larvæ</i>).	420 wheat grains.
253 grub worms.	471 barley grains.
160 May beetles.	190 oat grains.
1688 <i>Otiorynchus</i>	22 cherries.
(Weevils).	

From this Dr. Hollrung arrives at the following conclusions:

"1. The rooks examined have proved on the whole neither exclusively useful nor exclusively injurious. While 25 per cent. of the rooks' stomachs contained no vegetable matter, there were only two cases in 131 where no animal matter was found.

"2. Their food consisted for the most part (about 66 per cent.) of animal matter, such as mice, larvæ of the grain-eating Carabid (*Zabrus gibbus*), grub worms (*Melolontha vulgaris*), dung beetles (*Aphodius spec.*), and clover weevils (*Otiorynchus ligustici*). The vegetable food was made up of wheat, oats and barley and cherries.

"3. The harm done by the rooks on the one hand was perfectly balanced, and even considerably outweighed on the other hand by the useful services rendered.

"4. The rooks feed principally on slowly moving insects."

The common crow (*Corvus americanus*)

*Siebenter Jahresbericht ueber die Thätigkeit der Versuchs-station für Pflanzen schutz zu Halle a. S. 1895, Dr. M. Hollrung.

represents, perhaps, in this country, as nearly as may be, the economic position occupied by the rook in Europe, and a few points of comparison in their food may not be without interest. The writer has examined about 900 stomachs of the American crow, taken at all times of the year and representing a considerable portion of the United States. Unfortunately Dr. Hollrung's rooks were all taken in the months of April, May and June, and within a restricted area of country, so that the stomachs probably show a larger percentage of animal food than the average for the whole year. The food of the crow for the same three months contains about the same proportion of animal and vegetable matter.

In the first four items of the above list the crow and the rook present a great similarity of taste, the *Lachnosterna* of this country replacing the *Melolontha* of Europe. It is in the next two items, the weevils, that the rook shines resplendent. An average of over thirteen specimens of those small but very harmful beetles in each of the 131 stomachs is certainly a splendid showing. The only American bird whose stomach the present writer has examined that can approach this record is the red-winged blackbird (*Agelaius phoeniceus*), which shows a very decided taste for the snout beetle.

While many of these beetles were eaten by the crow, they did not constitute so constant and important an item as in the case of the rook. The crow eats a considerable number of Carabid beetles, most of which are of the more predaceous species, while those eaten by the rook are for the chief part the larvæ of *Zabrus gibbus*, a very destructive grain-eating species. Grasshoppers, which are extensively taken by the crow, are conspicuously absent from the food of the rook.

In the varieties of vertebrate food the rook is far behind the crow. Only seven-

teen mice were found in the 131 stomachs, and in no case did any stomach contain the remains of more than one. The crow, on the other hand, not only preys upon mice and other small mammals, but even captures young rabbits and eats many snakes, young turtles, salamanders, frogs, toads and fish. The crow also eats many crayfish and other smaller crustaceans which do not appear in the rook's bill of fare.

In the matter of vegetable food the rook does not seem to indulge in any great variety in April, May and June, but probably the other months would show many additions to the list. The crow eats about every kind of grain that the country produces, besides fruit and acorns or other mast. The crow appears to be far more omniverous than the rook; in fact, it seems doubtful if there is anything eatable that a crow will not eat, while, as far as shown, the rook seems quite exclusive.

In the comparison of these two birds the evidence appears to be in favor of the rook, although the economic difference is not great.

The proportion of harmful insects is somewhat greater with the rook, and its vegetable food does not include so many items of useful grains as with the crow. It is not possible, however, to come to any very definite conclusion until more stomachs of the rook shall have been examined, covering the other months of the year.

F. E. L. BEAL.

WASHINGTON, D. C.

AN INVESTIGATION WITH RÖNTGEN RAYS, ON GERMINATING PLANTS.

THE marked attention which the Röntgen or X-rays are receiving from investigators of this and other countries, and the popular excitement felt in the investigations, render all papers on this subject of particular interest.

The first record of experiments with

these rays in their effect on plants known to the writer is a recent article by Alfred Schober presented to the German Botanical Society.* Schober was led to the investigation by the similarity between X-rays and ultra violet light, which was pointed out by Röntgen in his first paper. The subject appeared particularly worthy of investigation, as Sachs had shown that heliotropic curving is incited in plants by blue, violet and invisible ultra violet rays in about an equal degree with full white light; while the red, yellow and green parts of the spectrum are apparently inactive.

Rothert, in his very extensive work on heliotropism, found the cotyledon† of germinating oat plants to be particularly sensitive to the action of light, and these were thus selected for the experiment. Vigorous plants germinated in full light, with cotyledons from 1 to 2 centimeters long, were selected and set in damp sand in a dark box, the walls of which were about 1 centimeter thick and blackened on both sides. A Hittorf's tube was placed at one end of this box at the height of the seedlings and about one centimeter distant from the box. The seedlings were arranged at one end of the box so that they were about 2 centimeters distant from the tube. The inductor had a spark length of about 12 centimeters, and was kept at its highest capacity during the experiment. A photograph of a hand could have been taken under the same conditions at a distance of 30 centimeters in five minutes.

The plants were first exposed to the action of the rays for 30 minutes, after which an examination showed that no ap-

* Schober, Alfred, 'Ein Versuch mit Röntgenschen Strahlen auf Keimpflanzen.' *Berichte d. Deut. Bot. Gesellsch.* Bd. 14, Heft 3 (April, 1896), p. 108.

† *Cotyledo* is a term introduced by Rothert (Cohns' *Beiträge zur Biol. der Pflanzen*, Bd. 7, p. 25) to designate the leaf-like organ of the form of an almost cylindrical closed sheath which appears first after the roots in the germination of grass seeds.

parent effect had been produced. The box was then closed and the exposure continued for another half hour. A careful examination at the end of this time led to the conclusion that no visible effect had been produced. It was found impracticable to continue the experiment longer, as the tube in this time had become excessively heated.

After the experiment was concluded the plants used were proved to be normally sensitive, as an exposure of one hour to diffused daylight, passed through a small horizontal slit, resulted in a noticeable curvature which in four hours had reached 60° from the vertical.

As the inductor was excited to its greatest capacity during the experiment, the plant being placed in as close proximity to the light as possible—and as after the experiment the plants were found to be normally sensitive, showing noticeable curvature on an equal exposure to diffuse white light—the author concludes that the new rays appear to differ from light in that they do not stimulate heliotropic curvature.

This contribution to our understanding of the action of the X-rays on plants is very interesting, but it is not thoroughly satisfactory. While light induces a noticeable curvature on certain plants in one hour, the X-rays may not be so active. Until it is possible to expose the plant to the action of the X-rays for a longer time we are not justified in concluding that they have no power to induce heliotropic curvature.

H. J. WEBBER.

U. S. DEPARTMENT OF AGRICULTURE.

CURRENT NOTES ON PHYSIOGRAPHY.

GREAT VALLEY OF CALIFORNIA.

F. L. RANSOME discusses the heavy cover of fluviatile sediments, at least 2000 or 3000 feet thick, that form the floor of the Great Valley of California, in their bearing on the theory of isostasy (Bull. Dept. Geol., Univ.

Cala., i, 1896, 371). Although chiefly concerned with geological problems, the essay gives a good general description of this typical fluviatile plain, dividing it into three sections, two of which are drained by the Sacramento and San Joaquin rivers, while the third sheds its waters into Tulare lake, of intermittent overflow. The great flat fans built forward by the larger streams from the Sierra are recognized as controlling the unsymmetrical position of the main rivers. The Sacramento and Feather rivers are said to 'pursue a winding course on low ridges;' this unsatisfactory and exaggerative term, 'low ridges,' being quoted from the Marysville folio, U. S. Geol. Atlas, to name the very faintly convex flood plains built by the rivers themselves. The smaller streams from the mountains "seldom reach the Sacramento directly, but are lost in the intricate plexus of sloughs which meander through the tule (reed) lands bordering the main river." A similar study of the Po in its relation to the Alps and Apennines would probably bring out many resemblances between these great fluviatile depositories of mountain waste.

NORWEGIAN COAST PLAIN.

AN instructive account, by Richter, of his studies last summer concerns the Norwegian coast plain (Globus, lxi., 1896, 313), on which Reusch has already given a brief report (Norg. geol. Undersög., 1894, with map; Chicago Journ. Geol., ii., 1894, 347). The coast plain, not to be confused with ordinary coastal plains of uplifted marine sediments, is wave cut in solid rock with little regard to structure, and is terminated landward by an abrupt ascent to the highlands. The visible breadth of the plain varies greatly, depending first on its original exposure to the waves, and hence having greater expansion on the ocean front and weakening to a mere strandline or disappearing entirely in the fiords; second,

on its present attitude with respect to sea level, some broader parts rising 100 meters, others being entirely submerged. The open valleys of the interior, which are abruptly cut by the steep fiord walls, are referred to the same epoch and base-level as the coast plain. The plain was made in preglacial time, and its uplifted surface is now much dissected. Richter emphasizes what Reusch said as to the important control exerted by the plain on the distribution of population and adds: "I regard this Norwegian coast plain as the greatest known example of well-proved marine erosion; perhaps the only one of so great dimensions in the world." The account is illustrated by four good views.

EQUATORIAL COUNTER CURRENTS.

A LARGE atlas issued last year by the Dutch Meteorological Institute at Utrecht, entitled 'De Guinea en Equatoriaal Stroomen,' clearly exhibits the periodic expansion of the Atlantic counter current in the northern summer; but unfortunately the area charted does not reach west far enough to take in the head of the current. From January to March, when the monsoon-like extension of the southeast trade across the equator as a south or southwest wind is practically wanting, the counter current is weak, irregular, and of small area. From July to September, when the southwest monsoon extends to 10° N. Lat. in mid-ocean, and even further north near the African coast, the counter current becomes definitely established between 4° and 9° or 11° N. Lat., with normal westward currents on either side. The strong temperature gradient on the northern border of the counter current near the African coast shows that it is not fed there by the North Atlantic eddy, as is represented on certain charts.

The January and July current charts in the atlas of the Pacific ocean lately issued by the Deutsche Seewarte (following sim-

ilar atlases of the Atlantic and Indian oceans, with their sailing hand-books already published) gives additional confirmation of the control of equatorial counter currents by the monsoon-like extension of a trade wind across the equator into the summer hemisphere; first, by showing a great increase in the breadth of the counter current north of the equator in the chart for July, this being the only counter current ordinarily shown in the Pacific; second, by exhibiting in the chart for January a distinct counter current south of the equator in the western part of the ocean, about the Solomon islands, where alone in the Pacific the northeast trades cross the line into the southern hemisphere and blow for a time as north or northwest winds.

PLANETARY AND TERRESTRIAL CURRENTS.

THE current charts above referred to confirm the association of the general oceanic surface eddies with the change from day to night, the belt-like arrangement of the zones, the general circulation of the atmosphere, and the systematic deflections of the annual isotherms, as correlated features of a rotating, sun-lit, ocean- and air-bearing planet. Further, they confirm the association of faster currents (in temperate latitudes at least) in the winter hemisphere as well as of equatorial counter currents in the summer hemisphere, with the seasons and the migration of the isotherms, as well as marked characteristics of our own tilted-axis planet. Finally, they confirm the association of the irregular development of oceanic eddies and counter currents with the irregular outlines of the continents and oceans, and the various exaggerated deflections of the isotherms, as individual, non-geometrical features of the irregularly wrinkled earth. All this suggests a natural order of classification and presentation of these varied but related facts. It is the individual peculiarities of the lands and

waters that produce a broader counter current north than south of the equator in the Indian ocean, that limit the south counter of the Pacific to the western part of that ocean, and that exclude a south counter current entirely from the Atlantic.

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CURRENT NOTES ON METEOROLOGY.

THE CLIMATOLOGY OF MARYLAND.

A SECOND edition of the *Climatology of Maryland*, originally published in 1894, has been issued as the *Second Biennial Report of the Maryland State Weather Service*. The data used in this compilation are the observations of the years 1892 to 1895, inclusive, and five charts accompany the report, showing the mean seasonal and mean annual precipitation and temperature. The Maryland Weather Service, organized in 1891, under the joint auspices of the Johns Hopkins University, the Maryland Agricultural College and the U. S. Weather Bureau—a very happy combination of elements—deserves great credit for the work it is doing for meteorology in the United States.

METEOROLOGICAL OBSERVATIONS IN SCHOOLS.

THE Connecticut State Board of Education has issued a pamphlet on *Meteorological Observations in Schools* (Conn. School Doc. No. 10, 1896), which is intended to serve as an outline for the use of teachers who wish to give their scholars some practice in taking systematic meteorological observations of the simplest character. The time has come when some beginning in the teaching of meteorology in our schools should be made, and in order that such instruction may be systematic, and may serve as a basis for more advanced work in the later school years, an outline such as the present one is necessary. Teachers who are giving any attention to meteorology will find the pamphlet useful.

OTHER NOTEWORTHY PUBLICATIONS.

THE following recent publications are worthy of note:

H. C. RUSSELL: *A Map Showing the Average Monthly Rainfall in New South Wales*. (Read before the Royal Society of New South Wales, November 7, 1894.) The map shows, for each square degree of the Colony, the mean rainfall for every month.

SÜRING UND BERSON: *Die XV. Fahrt des Ballons 'Phönix' am 1 July, 1894*. (Zeitschr. f. Luftschiffahrt, February–March, 1896, 29–53.) An account of a balloon ascent to an altitude of 17,226 feet. Full meteorological observations were taken.

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SCIENTIFIC NOTES AND NEWS.

ASTRONOMY.

THE Saxon Academy has recently published a paper by Dr. Bruno Peter, containing the results of his observations with the new Repsold heliometer of the Leipzig observatory. The paper contains an extensive investigation of the instrument and a determination of the parallaxes of three stars whose parallaxes had not previously been measured. The most interesting thing brought out in the investigation of the instrument is an experimental verification of the possibility of eliminating entirely the effects of a varying focal adjustment of the eye-piece by the use of certain peculiarly shaped diaphragms in front of the object glass. That this is possible had been previously suggested from theoretical considerations by Dr. Abbe, of Jena. The only point in which Dr. Peter's method of observation differs materially from that usually employed is in the determination of the error of runs separately for each observation, instead of employing a constant value for the night.

The parallax observations have been effected very nearly according to the program used by Gill. The results obtained are as follows:

Parallax.

Bradley 3077,	+0''.13	±0''.012
Arg.-Oeltz. 10603,	+0''.17	±0''.013
31 Aquilæ,	+0''.06	±0''.015

It is to be regretted that Dr. Peter has not yet published the results of his observations of other stars. One would have supposed that the first publication of observations made with a new instrument would include the results obtained for stars observed elsewhere. Thus a comparison with the work of other observers would have furnished a certain check upon Dr. Peter's own work. The stars whose parallaxes have been observed by Dr. Peter, but still remain unpublished, are :

Eta Cassiopeiae,	Theta Ursae Majoris.
Mu Cassiopeiae,	Beta Coma Berenicis.
Lal. 15290,	Lal. 18115.

THE *Astronomical Journal* of June 4th contains a determination, by Mr. Eric Doolittle, of the secular perturbations of Mercury by the Earth. The computations were made according to the method of Gauss. There is also an orbit of Gamma Coronae Borealis by Dr. See. Prof. Comstock calls attention to the fact that his observations for the determination of the constant of aberration by Loewy's method show evidence of the existence of systematic error depending on magnitude in the observation of the right ascensions of the fundamental stars with the meridian circle. H. J.

HONEY ANTS.

AN interesting paper by Mr. W. W. Froggatt, of the Australian Museum, on Australian honey ants, has just been reprinted from the 'Report of the Horn Expedition to Central Australia; Part II., Zoölogy.'

Camponotus inflatus, Lubbock, has long been known (since 1880) to possess an inflated form of worker which the other ants in the colony use as store houses for the preservation of saccharine substance, just as is the case with the honey ants of Mexico, Colorado and Sarawak. The present paper describes two new species, *Camponotus cowlei* and *C. midas*, both congeneric with Lubbock's species and both possessing the honey-storing habit, though in less marked degree than *C. inflatus*. In fact, *C. cowlei* seems to be, to a certain extent, a transition form, or a form in which the differentiation into the honey-bearing workers has not proceeded to its fullest extent. Even in *C. inflatus* there is little or no structural difference between the

honey-bearing workers and the ordinary worker, but the honey bearers are quite incapable of movement and must be fed by the ordinary workers. With *C. cowlei*, however, the honey bearers, although considerably swollen, seem to be able to move about slowly. It is possible that the only colony observed was a young colony and that the 'rotund' had not reached its full individual development. There is no hint by the writer that with the *Camponotus* honey ants there is any tendency towards the change to honey bearers on the part of certain of the workers by reason of any peculiar structure or form of intestine or abdominal walls, as has been suggested by Dr. McCook in the case of our Colorado *Myrmecocystus*. The development of this extraordinary habit in certain species which are perfectly congeneric with many other species in other parts of the world in which there is no tendency in this direction is not the least interesting phenomenon connected with this extraordinary subject. L. O. H.

SCIENTIFIC CONTRIBUTIONS FROM THE MISSOURI BOTANICAL GARDEN.

*The American Walnuts and Hickories.** The present paper, which in the main accepts the specific limitations and nomenclature of Prof. Sargent's *Silva of North America*, is devoted mainly to an analysis of the characters by which the hickories and walnuts and butternut may be distinguished in their winter condition, it being claimed that the characters afforded during that season are even more satisfactory than those obtainable during the earlier period of growth. The twig and bud characters and the characters of a great variety of fruits are illustrated in detail, and reproductions are given, direct from photographs, of the bark of a number of the species. Several interesting hybrids are also discussed in detail.

The Agaves of the United States.† About

* *Juglandaceæ of the United States.* By William Trelease. Issued May 26, 1896. Reprinted from the Seventh Annual Report of the Missouri Botanical Garden. Pages 25-46, plates 1-24.

† *The Agaves of the United States.* By A. Isabel Mulford. Issued May 26, 1896. Reprinted from the Seventh Annual Report of the Missouri Botanical Garden. Pages 47-100, plates 26-63.

twenty years ago the late Dr. Engelmann made an attempt to classify and describe the species of *Agave* of the United States, the genus to which the Century plant and Maguey belong. Since that time much information and material have been accumulating, and in St. Louis, where Engelmann's notes and specimens are preserved, the study of this difficult genus has been again undertaken. Miss Mulford, whose work was the basis of a thesis for which she obtained the degree of Doctor of Philosophy from Washington University in 1895, has brought together in a carefully arranged synoptical form the technical descriptions of all of those species which are now recognized as occurring within the limits of the United States, and has added much information of a popular character concerning their economic uses. The paper is supplemented by reproductions of habit photographs and a large series of accurate detail illustrations from drawings by Miss Johnson.

*Two Interesting and Rare Water Plants.** Mr. Thompson gives an exhaustive account of the structure, and, so far as known, the biology, of two very rare duckweeds, *Wolffia gladiata*, var. *Floridana*, and *W. lingulata*, the former heretofore known only from Florida, but collected last year in the swamps of southern Missouri, where it occurs associated with other peculiarly Floridan plants, such as *Leitneria*; the other heretofore known only from the Mexican tablelands, but detected by Mr. Thompson in Kern County, California, last year.

GENERAL.

THE associated press sends news of a terrible earthquake disaster in the Island of Yesso, Japan. It is stated that there were as many as 150 shocks lasting in all about 20 hours. The earthquake and the accompanying tidal wave caused great loss of life and property.

THE library building presented to the town of Branford, Conn., by Mr. Timothy Blackstone at a cost of about \$300,000 was dedicated on June 17th.

* The Ligulate *Wolffias* of the United States. By Charles Henry Thompson. Issued May 26, 1896. Reprinted from the Seventh Annual Report of the Missouri Botanical Garden. Pages 101-111, plates 64-66.

THE *Scientific American* states that the Egyptian government has determined to commence a geological survey. The work will be begun this year, and will take about three years for its completion. The estimated cost is \$125,000. Capt. H. G. Lyons, R. E., who is at present engaged under the Public Works Department of the Egyptian government in superintending the excavation of the ruined temples of Philæ, will have charge of the survey.

FIFTY photographs from the recent exhibition at the Cosmos Club, Washington, have been selected for purchase by the U. S. National Museum. There will be held next year at Washington a second exhibition of art photography under the name of 'The National Photographic Salon of 1897.'

THE Romanes Lecture for 1896 was delivered by the Right Rev. the Lord Bishop of Peterborough, on June 17, his subject being: 'English National Character.'

WE learn from *Nature* that Sir George Stokes and Dr. Carl L. Griesbach, Director of the Geological Survey of India, have been elected honorary members of the Austrian Academy of Sciences. Dr. Roux has been elected Associate of the Academy of Medicine in the room of the late M. Pasteur.

PROF. F. A. MARCH, of Lafayette College, the eminent philologist, will receive during the present month the degree of Lit. D. from Cambridge University, and the degree of D. C. L. from Oxford University.

MISS L. BRUCE has given to the University of Heidelberg a photographic telescope said to be even larger than the one she gave to Harvard University.

THE Mississippi Valley Medical Association will meet at St. Paul, Minn., under the presidency of Dr. H. O. Walker, from October 20th to 23d.

AT a meeting of the board of managers of the New York Botanical Garden on June 17th the Committee on Plans reported favorable progress, and the report of the Committee on Annual Members, Fellows and Patrons stated that a large number of annual members had been recently added to the rolls, and that President

Seth Low and F. F. Thompson had qualified as fellows by the payment of \$1,000 each. The Director-in-Chief, Dr. Britton, was authorized to secure the assistance of engineers, landscape architects and gardeners in preparing the plans for the development of the Bronx Park site. Several gifts were announced, including the herbarium of the late Harry Edwards, from Mrs. Esther Herrman.

Garden and Forest states that a preliminary meeting of citizens of New York interested in tree-planting in the residence portions of the city was held May 22d, and it was proposed to regularly organize the association and elect officers on Thursday, June 25th, at 3:30 p. m., in the rooms of the Wool Club. Mayor Strong has consented to the use of his name for President, and many well-known citizens have signified their intention to become members. The annual dues of the society will not exceed \$5.00, and the receipts will be used to publish pamphlets and in disseminating information to the public on the best methods of planting shade trees on streets, the best sorts for this purpose, etc. Application for membership may be made to Cornelius B. Mitchell, 64 and 66 White street, New York. We also learn from the same journal that seven hundred and seventy-five members have already enrolled themselves in the Audubon Society, established a few weeks ago in Boston. The object of the Society is to preserve our native birds by discouraging the use of their feathers in personal decoration. Among the Vice-Presidents of the Society are the senior Senator of Massachusetts, the President of the Massachusetts Historical Society, the President of the Massachusetts Society for Promoting Agriculture, and many other well-known citizens and a number of women distinguished for their artistic and social attainments. Any one can become a member of the Society by agreeing not to purchase or wear the feathers of wild birds and paying \$1.00. The Secretary, to whom all communications should be addressed, is Miss Harriet E. Richards, Boston Society of Natural History, Boston. There are no annual dues.

A NEW monthly journal, devoted especially to the study of children, edited by Prof. Earl

Barnes, will hereafter be published from Stanford University.

AN X-ray studio has been opened by Mr. M. F. Martin, at 110 East 26th street, New York.

IN a paper first presented before the Michigan Academy of Science, and now printed in *The Inlander*, Mr. Harlan I. Smith urges the importance of making a systematic archaeological survey of the State of Michigan, with the University as headquarters. It would be a great advantage to have recorded on a map the position of pre-historic remains, in order that permission might be obtained to make scientific excavations when opportunity offered, and in order that preference might be given to those remains least likely to remain intact.

THE degree of D. C. L. will be conferred by Oxford University on Sir Archibald Geikie, K. C. B., F. R. S., Director-General of the Geological Survey of the United Kingdom.

MISS HELEN KELLAR, who, deaf and blind, has displayed unusual ability, will be placed, next autumn, in the Gilman training school, with a view to preparation for Radcliffe College. The education and mental attainments of Helen Kellar are even more interesting than in the case of Laura Bridgeman. Those who are interested will find an account by her able teacher, Miss Sullivan, in a publication from the Volta Bureau, 1892, and in an article by Prof. Jastrow in *The Psychological Review* for 1894.

IN a recent number of SCIENCE we called attention to the international membership of the German Chemical Society. A striking contrast is found in the recently published list of members of the Chemical Society (London). Out of 2,067 members, over eighty-five per cent. are residents of the United Kingdom, and more than half the remainder of British colonies. Of the 140 foreign members 92 are American, 16 German, 7 Japanese, and the remaining 25 from eighteen different countries. Considering the Journal of the Chemical Society and its invaluable abstracts, it is rather surprising that the Society should have so few members outside of the British Empire.

THE first part of a very important work by Drs. D. S. Jordan and B. W. Evermann, en-

titled 'The Fishes of North and Middle America,' has been for some time in type and will be published shortly by the Smithsonian Institution. This part will be a volume of over 1,250 pages and will embrace descriptions of 1,239 species under 522 genera. According to the preface, "the classification and sequence of groups * * * adopted is essentially that of Dr. Theodore Gill," and the part in press covers the families from Branchiostomidæ to Priacanthidæ, including 148 families. The second part, which may be even larger than the first, it is expected, will appear early next winter.

ACCORDING to the *British Medical Journal* a society has recently been formed entitled 'L'Alliance Nationale pour le Relèvement de la Population Française par l'Egalité des Familles devant les Impôts.' M. Bertillon, the Director of the city of Paris statistics, is the founder of the Society. A committee has been formed composed of M. Bertillon; Prof. Richet, of the Paris Medical Faculty; Dr. Javal, member of the Academy of Medicine and of the Chamber of Deputies; M. Honnorat and M. Cheysson. The first meeting of the Society was held on May 16th, and was attended by about a hundred people.

THE daily papers contain several communications regarding reputed anticipations of the X-rays sufficiently curious to deserve repetition. Dr. G. A. Brown is stated, by the *Grand Rapids Herald*, to have in his possession a magazine entitled the *Mechanics' Mirror*, which, in 1846, is said to contain this announcement: "The following communication was made to the Académie Royale des Sciences de Paris at its last meeting by a Greek physiologist, A. M. Esseltja, who asserts that by the assistance of electric light he has been enabled to see through the human body, and thus to detect the existence of deep-seated disease. He has followed the operations of digestion and of circulation. He has seen the nerves in motion. M. Esseltja has imposed the name of 'Anthroposcope' on his extraordinary discovery (?). According to the *Scientific American*, Mr. John P. Moss writes to the *Daily News* under the heading 'Nothing New under the Sun,' quoting the following paragraph from Dr. Priestley's *Electricity*,

1769. It describes an experiment made by Mr. Hawkesbee in 1709. "He (Mr. Hawkesbee) lined more than the half of the inside of a glass globe with sealing wax, and having exhausted the globe, he put it in motion; when, applying his hand to excite it, he saw the shape and figure of all the parts of his hand distinctly and perfectly on the concave superficies of the wax within. It was as if there had only been pure glass and no wax interposed between his eye and his hand." Baron Reichenbach claimed that his light from the poles of a magnet would pass through the fingers.

MR. G. C. BOURNE has contributed to *Science Progress* two interesting articles on the present position of the cell theory. After reviewing recent work and theories he concludes that life is possible only when two (or more) substances of complex chemical constitution are brought together, and that when these two (or more) substances are brought together we have before us a cell. The cell, therefore, is the vital unit κατ' ἐξοχήν. The component parts of the cell are not vital units, for by themselves they are incapable of life; they are the auxiliaries, the indispensable auxiliaries of life, but they are not themselves living. If this be true it is entirely inconsistent with the whole group of theories based upon hypothetical biophors, gemmules, plasomes, physiological units, plastidules et hoc genus omne. The cell theory is the only theory which our knowledge of structure and of life processes permits us to adopt, at least if we confine ourselves to that part of it which is essential, namely, that there is one general principle for the formation of all tissues, animal and vegetable, and that principle is the formation of cells. Cells are the ultimate vital units, though they are not the ultimate structural units; they are the 'Lebensträger' or biophors, and there are no living individuals lower than cells.

PRESIDENT JORDAN, in his *Fishes of Sinaloa*, has recently published the first bulletin of The Hopkins' Biological Laboratory, the recently founded dependence of the Leland Stanford, Jr., University, and it will be received with a great deal of interest by the students of fishes generally. The paper, continuing the well-known work in this region of Dr. Gilbert, consists of a

systematic review of the fishes of the eastern shore of the Californian Gulf, in the Mexican province of Sinaloa. Twenty-nine new species are recorded, many of which are here figured, including a new Saw-fish and several new Sting-rays. The present work, however, can be regarded only as the result of a reconnaissance, although it is clearly of great value. Except in the case of *Chanos*, it deals with no osteological characters; and from the nature of the Hopkins expedition, one can hardly expect that any definite information could have been obtained as to the larval characters of these fishes, or as to the ranges of sexual variation.

ACCORDING to the London *Times*, the British Consul at Piræus mentions in his last report that a Pasteur Institute for the treatment of hydrophobia by inoculation has now been in existence in Athens for some time. During the first 16 months of its existence 201 cases were treated, of which 176 were from Greece, 21 from Egypt, and 4 from Asia Minor. There was only one death, and in this case the patient had delayed going for treatment until 15 days after being bitten. The whole credit of founding the institution belongs to Dr. Pampoukis, the director, who was sent to study under M. Pasteur in Paris in 1886, and who, on his return, started a microbiological institute at his own expense and conducted a series of valuable experiments for the government. He opened the Pasteur Institute in August, 1894, at his own expense; small allowances have since been made to him by the municipality and the government. It is practically impossible to overestimate the value of such an establishment in the Levant, and its existence ought to be widely known. Not only does the curse of masterless dogs exist in Greece, but even more so in the neighboring countries. A muzzling order does exist in Attica, but it is not enforced, and the strewing of poisoned meat in the streets of Athens and Piræus is apparently the only attempt made by the authorities to deal with an increasing amount of rabies. The lack of water and the prevailing disregard of all forms of animal suffering largely contribute to this result.

THE N. Y. *Evening Post* states that the agricultural extension work carried on by Cornell pro-

fessors under the provisions of the Nixon fund is being yearly extended. Originally confined to the Chautauqua grape belt, it was last year extended to Genesee. This year Prof. Bailey has organized work in Oswego county, where experiments in strawberry culture are to be made, and in Onondaga and Oneida counties. The work in each county partakes of the prevailing local farm industry.

THE School of Applied Ethics, which for the past four years has held sessions at Plymouth, will omit the session this year.

UNIVERSITY AND EDUCATIONAL NEWS.

DR. B. I. WHEELER, of Cornell University, has been elected president of the University of Rochester.

PROF. GRAVES, of Tufts College, has been elected president of the University of Wyoming.

MRS. S. W. BOCOCK has given \$5,000 to Yale University for the purchase of books in social science.

AT Cornell University an appropriation of \$15,000 has been made for constructing a hydraulic laboratory for the College of Civil Engineering, and \$30,000 has been appropriated for an addition to Lincoln Hall, for the accommodation of the College of Architecture.

THE present and past students of Radcliffe College and the Cambridge School are uniting to found a scholarship at Radcliffe College to be known as the Arthur Gilman Scholarship in recognition of the services of Mr. Gilman, who is about to resign his office of Regent.

AT Smith College Miss G. A. Smith has been appointed assistant in botany, Miss H. W. Bigelow, assistant in astronomy; Miss L. D. Wallace, assistant in zoölogy, and Miss E. S. Mason, instructor in chemistry.

DR. WESTERMAIER has been called to a professorship of botany in the University of Freiburg, Switzerland; Dr. Peltz to the chair of mathematics in the Technical High School at Prague, and Dr. Went to the professorship of botany in the University of Utrecht in the place of Prof. Rauwenhoff, who has retired.

AT the commencement exercises of Cornell University, President Schurman made an ad-

dress on Liberal Culture and Professional Education, in the course of which he justified the recent action of the University in offering the B. A. degree in place of the degrees of Bachelor of Philosophy, Science and Law. He held that liberal culture does not come alone from the study of classics. "If it be said that the action of Cornell University destroys the conception of liberal culture, I reply that, far from destroying the conception, it enlarges and revivifies it and brings it into living relation with all the intellectual and æsthetic elements of our modern complex civilization. It is folly to suppose that some parts of human knowledge are liberalizing, and others neutral or negative; or that some institutions yield culture, and others merely science."

DISCUSSION AND CORRESPONDENCE.

THE APPLICATION OF SEX TERMS TO PLANTS.

TO THE EDITOR OF SCIENCE: If I do not mistake Prof. Bailey's meaning in his article 'On the untechnical terminology of the sex-relation in plants' (SCIENCE, N. S. III., 825), he advocates a use of the terms male and female in semi-popular language which he acknowledges to be in reality incorrect, since he accepts as true the present view of the morphology of the members involved. It should be remembered that this usage arose when the morphology of the stamen and pistil was not understood, and when the ovule in the pistil was really believed to be an egg within an ovary and the pollen grain in the anther, the sperm within a spermary. The question to be discussed is "Shall this usage be continued in 'common' language?"

It may be conceded at once that it is of no practical importance to a horticulturist (whose interests Prof. Bailey clearly has at heart) whether he is taught to apply sex terms to flowers and their members or not. Seed time and harvest will not fail because he does not know the plants he deals with. But suppose a student whom Prof. Bailey has inspired with a desire for more extended study goes to another teacher for a course in morphology. He has been taught to call a stamen a 'male organ.' He is given a staminate flower of a pine. He is permitted to call its members stamens, and

in their 'maleness' his professor of horticulture has led him to believe. Very good. He is then given a shoot of *Equisetum*, bearing what the Manual is pleased to call a 'fertile spike.' He discovers its close resemblance to the former specimen, and perhaps thinks to call it a 'male flower' and its members 'male organs.' But as he studies the life history and seeks to discover the 'function of paternity,' in some unaccountable way the maleness vanishes, and instead he finds an organ exhibiting at the same time both 'maleness' and 'femaleness'—discharging at the same moment 'the function of paternity' and 'the function of maternity'—quite as truly, at least, as the stamens 'discharge the paternal relation.'

Will Prof. Bailey hold that the stamen-like sporophylls of *Equisetum* should, therefore, 'in the broad sense of common language,' be called hemaphrodite organs? If so, what will he say to the sporophyll of *Botrychium* or *Onoclea*, whose spores produce a bisexual plant? By what sex term will he designate untechnically the office of such sporophylls? I do not take him here beyond the plants with which the florist deals and about which he may rightly demand instruction. Surely, in this day, Prof. Bailey would not desire to perpetuate, even among amateurs, the fiction that between the ferns and the flowering plants there is a great gulf fixed? Yet the loose use of language which he advocates would seem to require an affirmative answer. Into what hopeless confusion this would plunge the poor student, only he can imagine who has seen the difficulty with which one eradicates from his thought and language the misleading analogies which he has merely acquired accidentally. How much more difficulty would they give were they inculcated by a trusted teacher!

Although Prof. Bailey enunciates briefly in his introduction the doctrine of the alternation of the sexual and non-sexual phases in plants, he seems to have failed to grasp its significance when he writes: "Surely the prothallus is no more sexual than a stamen or a leaf." The essential character of the sexual phase is that it produces gametangia, *i. e.*, sexual organs, in which the sex cells are differentiated. The essential character of the non-sexual phase is that

it produces sporangia, *i. e.*, non-sexual organs, in which spores are differentiated. All that morphologists ask of Prof. Bailey is that he use the same criterion with plants as with animals, applying, by a common grammatical figure, sex terms to the organs that produce sex cells, and to the plants that carry the sex organs. It is for this reason that it is proper to call a bull a male animal and a cow a female animal. But if the embryo produced by the union of their sex cells grew into an animal 1,000,000 times the size of the bull or the cow, and one of its giant cells formed within itself a bull and another within itself a cow, we should certainly not be justified in applying sex terms either to the monster or to any of its organs.

When Prof. Bailey asks to have the figurative use of the sex terms *extended so as to obscure the distinction between the sexual and non-sexual phases of the plant*, he asks us to return to a confusion from which botanical language has been happily delivered, and from which it is the duty of botanists to deliver 'common language.' This deliverance can be brought about simply by using untechnical terms already coined and by avoiding the use of sex terms for a purely vegetative organism. 'Staminate flowers' and 'pistillate flowers' are phrases quite as untechnical as 'male flowers' and 'female flowers,' and they have the advantage of avoiding the perpetuation of obsolete ideas.

Were the question merely one of morphological consistency it would be of comparatively little moment. But it is a question of clearness or confusion of ideas. If the mental eye, as it looks upon plants, be not single, the whole mind will be full of darkness; and if the morphological light that is in the student be darkness, how great is that darkness! To advocate one set of ideas for common language and another for technical is to advocate a return to that chaos of which the professional botanist himself was scarcely conscious until the light of the doctrine of the alternation of generations broke forth. In its light it behooves us to order our use of language that applied botany will be helped toward a clearer view of plant life.

CHARLES R. BARNES.

UNIVERSITY OF WISCONSIN.

SCIENTIFIC LITERATURE.

Antropometria Militare. By DR. RIDOLFO LIVI. Parte I. Text and Atlas. Roma. 190+ 419 pp; 23 plates.

The first part of Dr. Livi's great work on the anthropometry of Italy has recently been issued by the Director of the Italian Army Medical Journal. The work ranks easily among the most important contributions to anthropology. The fact that in past years Dr. Livi has contributed some of the most fundamental results of his extended and careful investigations to the *Archivio per l'antropologia e la etnologia* and presented others that are not less interesting to the Roman Anthropological Society and to the Eleventh International Medical Congress (Rome, 1894) has made the complete presentation of his data only the more eagerly expected. The present part contains the purely anthropological results of his investigations, while the second part will be taken up by hygienic and in a more general way sociological statistics.

The investigations are based on measurements and observations upon men born in the years 1859-63 and enlisted in the Italian army. The anthropometrical data that were collected are the following: Stature, circumference of chest, weight, length and breadth of head. Besides these a number of descriptive features were observed: Color of eyes and hair, complexion, character of teeth, form of forehead, of nose, of mouth, chin and face. These data have been worked up in the following detailed tables:

For each military district (Mandamento):

1. The frequency of statures in groups of from 5 to 5 cm.
2. The frequency of the various colors of the hair and of the eyes and that of the pure blonde and of the pure dark type.
3. The average cephalic index and its distribution in groups from 5 to 5%.

For the larger districts (Circondario) the preceding data are summarized and the following are added:

1. The relation between stature and color of hair.
2. The relation between stature and color of the eyes.
3. The relation between color of hair and color of eyes.

4. The relation between stature and cephalic index.

5. The relation between the cephalic index and color of hair.

6. The distribution of the cephalic index for each per cent.

For the provinces the previous data are summarized and the following are given in addition:

1. The distribution of the circumference of the chest in groups of 5 cm.

2. The relation between stature and circumference of chest.

3. The distribution of statures for each cm.

4. The frequency of the principal descriptive characters, form of hair, complexion, nose, face and chin.

These results are presented in a most attractive manner, on an atlas which brings home some of the salient results of Dr. Livi's extensive work at a single glance.

It is not possible to enter into all the important results which the author by the judicious use of good statistical methods has reached. From a general point of view the most important is perhaps the final proof of the fallacy of the theories of Dr. Ammon in regard to the effect of natural selection upon the development of the type of civilized man. A number of years ago Tönnies pointed out the weakness of his arguments (*Ztschr. für Psychol. u. Phys. der Sinnesorgane*), but it remained to Dr. Livi to finally prove the real cause of the phenomena which Dr. Ammon had observed, namely, that the inhabitants of the towns of Baden are more dolichocephalic than those of the country. Dr. Livi has shown that everywhere the cephalic index of the town population is nearer the average than that of the country population. Consequently in a brachycephalic region, such as Baden, the people of the towns are more dolichocephalic, while in dolichocephalic regions the reverse is the case (p. 86 ff.). The satisfactory explanation of this fact is that the town population are more mixed than the country population is. The author has proved that the same facts may be observed in regard to the distribution of color of hair and eyes and of statures, and I think that in this observation he has given a very strong proof of the heredity of stature.

Among other points of biological interest I mention the detailed investigation of the influence of the altitude of habitat upon the various measurements. The clearest and best pronounced example of such an influence that the author has found is that upon the circumference of the chest which increases with increasing altitude. The stature decreases quite considerably in the mountainous districts. The color is lighter than in the plains. The two last phenomena the author is inclined to attribute to an earlier arrest of development due to more unfavorable social conditions, but he does not deny the possibility of other influences of altitude upon the development of the human body. The observation that among the primitive Americans the stature also decreases with altitude seems to me to indicate that social conditions alone do not sufficiently account for the phenomenon.

Of special interest are also the detailed investigations on the correlations of the various observations, for instance, of the proportions of the head and the color of the hair which show clearly that the dark people are the more dolichocephalic ones, and that tall people have more frequently wavy hair than short people.

Most of the relations of measurements or observations treated by Dr. Livi are based on stature, *i. e.*, the individuals are grouped according to stature and the correlated changes of the other measurements have been recorded. While the results thus obtained are of great value it would probably have been better to treat them as correlations, that is to investigate also the reverse relation. The undue weight which is thus given to stature as compared to all other measurements would have been obviated by this means. This mode of treatment would have been the more desirable, as stature is one of the measurements which depend to a considerable extent upon the influence of environment. Besides this the distribution of stature as recorded by Dr. Livi is, as he himself points out, not that of the total population, as all those individuals who are unfit for military service are not included in the records. Thus all of less than 154 cm. stature are excluded, and among the others who were rejected for other reasons the lower

statures probably prevail. For this reason his average statures are all too high, and the distributions of statures appear more assymetrical than they would be if the total population were considered.

The remaining portion of the volume is taken up with a detailed discussion of the geographical distribution of the various anthropometric types. It is not possible to enter into this interesting subject at this place, and it may suffice to call attention to the important results that the author has reached. Historical events relating to the settling of certain portions of Italy are reflected with remarkable accuracy in the charts showing the distribution of types. I mention, for instance, the occurrence of a tall dolichocephalic type near Lucca, and the peculiarities of the type inhabiting Carloforte as compared to the rest of the inhabitants of Sardinia.

This exhaustive work will always remain the basis of all studies on the anthropometry of the people of the Italian Peninsula.

FRANZ BOAS.

Electric Lighting, a Practical Exposition of the Art for the Use of Engineers, Students and Others interested in the Installation or Operation of Electrical Plants. Vol. I. *The Generating Plant.* By FRANCIS B. CROCKER, E.M., Ph. D., Professor of Electrical Engineering in Columbia University. 8vo. VIII. 444 pp. New York, D. Van Nostrand Company.

In the preface the author states his belief—and he is undoubtedly correct—"that electric lighting has reached a sufficiently perfected and established state to allow of its being treated in a fairly satisfactory and permanent manner."

According to the plan adopted by the author, the subjects treated in this volume are taken up in the following order: Two chapters are devoted to the introduction and historical matter; the third discusses units and measures, and the fourth treats of the classification and selection of electric lighting systems. The clear and candid statement of reasons which should influence the selection of a system makes the fourth chapter of great practical value.

It is evident, however, that Prof. Crocker advocates the use of the direct current where many engineers would prefer to use an alter-

nating system; and while he very properly quotes the value of human life as one of the factors which should influence a decision, he seems to neglect the fact that good work and materials will render any current in commercial use practically safe, while want of care in wiring and poor insulation will, through the fire risks involved, make either system an indirect menace to human life, far more serious in its nature than the direct danger threatened by the employment of high voltage alternating currents.

Two chapters follow which consider location and buildings, and then the author proceeds to the consideration of sources of energy, prime motors, and the mechanical connections between engines and dynamos. The chapters devoted to these subjects fill two hundred pages, or nearly one half of the volume.

After these come two chapters in which the design and construction of electrical machines is briefly treated. There is no lumber in this part of the work, and the reader will miss the time-honored descriptions and illustrations which have been so prominent in electrical textbooks for the last fifteen years.

The next chapter is one of the most valuable in the book; it is largely taken from a work by Prof. Crocker and Dr. S. S. Wheeler, and contains more direct and practical instruction as to the care and use of electrical machinery than can be found in the same number of pages elsewhere.

The author knows his subject and knows how to tell what he knows, a rare combination one is sometimes tempted to believe.

The remainder of the work, about sixty pages, is devoted to accumulators, switch-boards and apparatus, and electrical measuring instruments.

The distribution and utilization of electricity for the purpose of illumination are subjects reserved for a second volume.

A very valuable feature of the book is found in the abundant reference made to books and papers treating single topics more fully than the limits of this work will allow.

It is practically impossible to give in a treatise of moderate size more than a small part of the matter absolutely necessary for the use of

the student when the subject treated is a branch of pure or applied science. And the author who neglects to avail himself of this simple method of enormously increasing the value of his book does grievous injustice to his subject, his readers and himself. No engineer can be a man of one book. The profession needs a broad and deep foundation. Outline treatises, schedules, abstracts from lecture courses and pocket manuals are valuable in their way, but they should be used only as guides to a systematic course of reading or as memoranda in which are collected the results of previous study.

No one probably knows the truth of these statements better than Prof. Crocker, and without doubt it is his recognition of the impossibility of making a complete presentation of his subject which has inclined him to supplement his text with so many valuable references. It is in this connection that the chief criticism upon this work is to be made. The sub-title, 'A Practical Exposition of the Art for the Use of Engineers, Students and Others interested in the Installation or Operation of Electrical Plants,' might fairly lead one to look for an encyclopedia or library even. The book is rather overloaded by its title.

The author has made excellent choice of his matter. The book is remarkably free from 'padding' and as we should expect in a work by Prof. Crocker, the form in which the topics are presented is direct and clear.

Like *Oliver Twist*, however, the reader is often inclined to ask for more of the same sort.

The student or engineer will find it helpful, if not complete. And we venture the assertion that the general reader and the "Others interested in the Installation and Operation of Electrical Plants" will find this on the whole the most satisfactory work published.

A. S. KIMBALL.

WORCESTER POLYTECHNIC INSTITUTE.

Our Native Birds of Song and Beauty. By H. NEHRLING. 4°. George Brumder, Milwaukee. Part XIV. June, 1896.

Again it is our pleasant duty to announce the appearance of another part of Nehrling's meritorious work on North American Birds.

It opens with an excellent colored plate of

the Dickcissel by R. Ridgway. The male is singing in a field of red clover, with the mother on her nest below. Another plate by Goering shows the meadow lark and the bobolink, and also the yellow-headed and red-winged blackbirds. The text treats of these species and also of several of the true orioles—Audubon's, Scott's, the hooded, orchard and Baltimore. The biographies, as in previous parts, take one into the woods and fields and marshes, where the birds live, and introduce him to the surroundings before bringing in the subject of the sketch. The matter on geographic distribution has received a little more attention than usual, and considerable information is given on food habits.

The announcement is made that two more parts will complete the present (2d) volume. This is good news, and we heartily commend the book to those who wish to procure, at a reasonable price, a reliable work, with colored plates, on the haunts and habits of North American birds.

C. H. M.

Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen. Eine geographische studie, VON EDUARD HAHN. Leipzig, Duncker & Humblot. 1896. 8°, pp. 581.

In this work the author has brought together in convenient form a large mass of facts concerning domesticated animals. He begins with the dog and ends with fish. Besides the ordinary domesticated mammals, he includes the yak, buffalo, deer, camel, lama, rabbit, cavy, and ferret. The number of birds treated is also considerable.

In dealing with the origin of the various breeds, the author usually quotes eminent authorities, rarely advancing views of his own. Footnote references are given in profusion, so that those interested in following up the subject shall not want for material.

The systematic part of the work, in which each animal is discussed at length, is followed by a geographical study, in which the several countries are discussed with respect to their domesticated animals.

C. H. M.

The Gypsy Moth. A Report of the Work of Destroying the Insect in the Commonwealth

of Massachusetts, together with an account of History and Habits, both in Massachusetts and Europe. By E. H. FORBUSH, Field Director, and C. H. FERNALD, Entomologist to the State Board of Agriculture. Boston. 1896.

The successive steps in the great experiment in economic entomology which has been carried on by the State of Massachusetts during the last five years are admirably portrayed in this volume. Never in the history of this country has so much money been spent by a State or by the General Government in fighting insects as has been used by Massachusetts against this one species, and it is most fortunate that the work has been in efficient hands and that no political jobbery has been connected with it since its start. Whatever the ultimate result of the experiment may be, it cannot fail to have been most instructive as bearing upon future work. The report is an admirable summary of the entire investigation. Mr. Forbush takes up the first half of the volume, some 250 pages, with a history of the gypsy moth in America, carefully detailing year by year the work of the State Commission down to and including the year 1895, following with a chapter on the increase and distribution of the insect, another on the methods used for destroying it, another on the influence of birds in the destruction of the species, and a final chapter on the progress of extermination. He treats fairly the obstacles to extermination, the principal ones being the enormous reproductive capacity of the moth, its very numerous food plants and the dense population of the infested region, which increases the danger of local distribution and reinfestation by the constant passing and repassing of infested centers by men and animals. In spite of these obstacles, however, Mr. Forbush shows that the insect has been locally exterminated, and argues that with sufficient appropriations it may be generally exterminated. He thinks that the policy of control or extermination of insect pests by government commissions, which has been so successful in certain European countries, might be applied in this case by the government of the United States.

The greatest scientific interest attaches to the second part of the report, which has been pre-

pared by Prof. Fernald. It includes a full bibliography and consideration of the distribution of the species in other countries, the methods used to destroy it abroad, an elaborate account of its life history, based upon the most careful original observations, a list of the plants upon which the insect has been known to feed in Massachusetts, another list upon which it has been known to feed in Europe, and, by comparison with these, a very small list of the plants upon which it will not feed. There is further a section on the anatomy of the adult insect and a full consideration of the natural enemies which affect the species both in Europe and in Massachusetts, and the part concludes with an elaborate account of the experiments which have been made with insecticides.

The portion of the report dealing with the biology of the species contains many sections of much importance. The exact experiments upon the amount of food, on the effects of temperature, on hermaphroditism, on polygamy, on assembling and on parthenogenesis are of particular interest. The experiments with insecticides show many results which are most surprising, and none more so than the feeding of caterpillars, for from five to ten days before causing death, upon leaves treated with strong arsenical solutions. In an interesting by-subject—the dying out of the species in England—Prof. Fernald advances a new theory. It has been stated by no less an authority than J. Jenner Weir that the gypsy moth has been exterminated in England simply by collectors. Prof. Fernald, however, is inclined to think that the darker color of the foliage and other surroundings in England have made the female moths more conspicuous objects to their enemies than they are on the continent of Europe, so that in the struggle for existence the species was exterminated before it had time to take on the darker color which would have protected it. The argument is a somewhat elaborate one, and this is simply the conclusion.

The volume is illustrated with a wealth of text figures and plates, and will forever stand as a monument to the enlightened energy of the State of Massachusetts and the practical and scientific ability of its authors.

L. O. HOWARD.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON, 263D
MEETING, MAY 30, 1896.

THEO. GILL spoke of *The Characteristics of the Families Salmonidæ and Thymallidæ*, saying that in 1894 he had given definitions of the two based on modifications of the cranium, the presence or absence of epipleurals, and the development of the dorsal fin. The *Salmonidæ* were supposed to have the 'parietal bones separated at middle by the intervention of the supraoccipital,' while the *Thymallidæ* had 'parietal bones meeting at middle.' Mr. Boulenger has denied the existence or value of these differential characters. As to the relations of the parietal and supraoccipital bones he was fully justified. The Coregonines generally have the parietals contiguous, and therefore the distinction of the Salmonids from the Thymallids on that basis must be abandoned. But there appears to be no reason for further abandonment. The epipleurals are well developed in *Thymallus*, while none could be found in *Salmo*, *Salvelinus*, *Argyrosomus* and *Coregonus*. It was suggested that Mr. Boulenger might have considered the epicentrals, which are common to both the Salmonids and Thymallids, to be what was meant by epipleurals. At any rate, Prof. Evermann and Mr. Lucas had both re-examined the question on specimens prepared by themselves and had reached the same conclusions as the speaker. There is no question about the difference between the dorsal fins of the two types. They may, therefore, be maintained as families differentiated by the combination of epipleurals and peculiar dorsal in the Thymallids and no epipleurals and normally constructed dorsal in the Salmonids.

Barton W. Evermann spoke of *The Fishes and Fisheries of Indian River, Florida*. Indian River is not a river at all, but a long, shallow salt-water lagoon shut off from the sea by a series of low and narrow islands.

The depth is usually not greater than 6 to 10 feet, and the density of the water varies from 1.013 to 1.019.

The total number of species of fishes now known from the river is 105, though further investigation will doubtless add many to the list.

Indian River is remarkable for the large num-

ber of important food fishes which it contains, no fewer than 25 species being handled by the fishermen. Among the most important may be named the following: Common mullet (*Mugil cephalus*), pompano (*Trachinotus carolinus*), bluefish (*Pomatomus saltatrix*), red drum (*Sciaenops ocellatus*), spotted squeteague, or sea trout (*Cynoscion nebulosus*), and the mangrove snapper (*Neomænis griseus*). The mullet is by far the most abundant of the food fishes.

The fisheries of this river have developed along with the completion of the Florida East Coast Railroad, which now furnishes excellent facilities for the shipping of fish to Northern cities. At first Titusville was the only important fishing center, but now several points further south are equally important. The severe cold in the winter of 1894-95 caused a considerable increase in the number of fishing firms. Several growers of oranges and pineapples, finding their orchards ruined, have turned their attention, temporarily at least, to fishing.

F. A. LUCAS, *Secretary*.

THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, JUNE 9, 1896.

PAPERS under the following titles were presented for publication:

'Contributions to a Knowledge of the Hymenoptera of Brazil; No. 1, Scoliidæ,' by Wm. J. Fox.

'The Correct Position of the Aperature of Planorbis,' by Frank C. Baker.

'The Mesenteries of the Lacertilia,' by E. D. Cope.

'Revision of the Slugs of North America, Ariolimax and Aphallarion,' by Henry A. Pilsbry and E. G. Vanatta.

Dr. Harrison Allen made a communication on forms considered specific, but which were merely instances of arrested development. He referred in illustration to certain species of *Vespertilio*, claiming that *lucifugus* is merely an arrested form of *gryphus*, the species *albescens* also being based on similar characters. He had applied the term pædomorphism to the condition which had been worked out, he believed, only among the bats and by himself. He held that the specific names of such forms were not valid and should be dropped.

Dr. Horn stated that many such instances of arrested developments were found among insects. He referred to the dimorphic males of *Eupsalis minuta*, a rhyncophorous beetle, on which a French writer had founded three species. The egg-depositing habits of the female and the assistance occasionally rendered by the male were commented on.

Botanical Section, June 8, 1896. Dr. Chas. Schaeffer, Recorder. A paper was read from Mr. Thos. Meehan on *Erigeron strigosus*. A tendency of the ray florets to become discoidal, together with an acceleration from the lingulate to the discoid condition, was noted. The hermaphrodite state of the flower is not established until the tubular condition becomes permanent.

Dr. Ida A. Keller recorded the fact that if a cold alcoholic solution of chlorophyll be treated with benzol, the chlorophyll will be extracted and float as a green film on the surface of the liquid.

Records were made by Mr. Stevenson Brown, Mr. Crawford and Mr. Williamson, of unusual distribution of species.

EDW. J. NOLAN,
Recording Secretary.

MEETING OF THE NEW YORK SECTION OF THE AMERICAN CHEMICAL SOCIETY.

THE June meeting of the New York Section of the American Chemical Society was held on Friday evening, the 5th inst., at the College of the City of New York, Prof. A. A. Breneman presiding.

After the reading of the minutes the chairman of the Committee on Organization of the Chemical Club reported that at a recent meeting of the committee, held at the Board of Trade, much enthusiasm was shown, and the movement was making good progress.

A communication from the Joint Commission of the Scientific Societies of Washington in regard to the Senate bill 1552, intended to restrict, if not prohibit, vivisection, was taken up and acted upon.

The sentiment of the meeting was unanimous in the direction of preventing affirmative action by Congress on the said bill; and the following resolutions were unanimously adopted, after a full discussion, in which Profs. Sabin, Breneman, Doremus, Hale and McMurtrie participated.

Resolved, That the New York Section of the American Chemical Society most earnestly opposes the legislation proposed by Senate bill 1552, entitled 'A bill for the further prevention of Cruelty to animals in the District of Columbia.'

Resolved, That the proposed legislation is unnecessary and would seriously interfere with the advancement of biological science in that District; that it would be especially harmful in its restriction of experiments relating to the cause, prevention and cure of the infectious diseases of man and of the lower animals; that the researches made in this department of biological and medical science have been of immense benefit to the human race; and that, in general, our knowledge of physiology, of toxicology and of pathology, forming the basis of scientific medicine, has been largely obtained by experiments upon living animals, and could have been obtained in no other way.

Resolved, That physicians and others who are engaged in research work having for its object the extension of human knowledge and the prevention and cure of disease are the best judges of the character of the experiments required and of the necessity of using anesthetics, and that in our judgment they may be trusted to conduct such experiments in a humane manner, and to give anesthetics when required to prevent pain. To subject them to penalties and to espionage, as is proposed by the bill under consideration, would, we think, be an unjust and unmerited reflection upon a class of men who are entitled to our highest consideration.

Dr. C. A. Doremus read a 'Note on Presence of Oil in Boiler Scale.'

Mr. J. A. Matthews described 'A New Method of Preparing Phthalimid.'

The chair announced this as the last meeting of the season, and stated that the fall and winter meetings would probably be held in the same rooms.

DURAND WOODMAN,
Secretary.

PROCEEDINGS OF THE TORREY BOTANICAL CLUB, MAY 27, 1896.

THE last regular meeting of the season was held in Hamilton Hall, Dr. Schneider occupying the chair. One new member was elected.

Dr. John K. Small read his announced paper : 'Notes on the Flora of Yadkin Valley, N. C.' He spoke of the character of the Yadkin River and the geology between Salisbury, N. C., and the district where the Yadkin becomes the great Pedee. He discussed the great similarity of Dunn's Mountain, N. C., and Stone Mountain, Ga., the fact strongly emphasized by the local species common to both localities. He then gave a running account of the general floral features of the Yadkin Valley and summarized the phenomena as follows:

I. Several new species have lately been discovered in that region, viz: *Acer leucoderma*, *Solidago Yadkinensis* and *Quercus Phellos* $\times$ *Q. digitata*.

II. Several typical members of the prairie or plains flora are perfectly at home there, as *Scutellaria campestris* and *Solidago radula*.

III. Plants thought to be confined to the granite outcrop of Georgia are common, viz: *Arenaria brevifolia* and *Diamorpha pusilla*.

IV. Alleghenian or subalpine species as *Waldsteinia fragarioides* and *Anemone trifolia* occur there.

V. One species, *Lotus Helleri*, is endemic.

VI. A typically northern and very local species *Solidago Purshii* reaches a greater development, and is more abundant than elsewhere.

VII. A normally tropical species *Portulaca pilosa* abounds in certain places.

VIII. Generally local plants are represented by *Clematis ochroleuca*, *Verbena riparia*, *Oxalis recurva* and *Aster ptarmicoides Georgianus*.

Remarks were made and a discussion followed on the growth of plants in regions which for long periods at a time are devoid of rain.

A number of cut flowers of *Arethusa bulbosa* were presented to the members by Miss Rachel Farrington, of Lakewood, N. J.

W. A. BASTEDO,
Secretary pro tem.

KANSAS UNIVERSITY SCIENCE CLUB.

At the twelfth annual meeting, held at Snow Hall on June 4th, the following program was presented:

On *Hesperornis*, S. W. Williston; The Groups of

Motive in the Plane, H. B. Newson; The Motion of a Semispherical Shell on a Horizontal Plane, A. Emch; New Methods of Demonstration in Botany, M. A. Barber; Theory of the Satellites of the Earth and Mars, E. Miller; Stratigraphy of the Fort Benton, W. N. Logan; Construction and Use of an Interference Refractometer, M. E. Rice; A New Species of Sabre-toothed Cat, E. S. Riggs; On Double Sulfates, H. P. Cady; Further Investigations regarding the Constituents of the Dandelion Root, L. E. Sayre; Analysis of a Gypsum from Marshall County, L. Page; Analysis of House Paints, W. R. Mason and E. L. McCoy; Certain Principles in the Construction of Disruptive Discharge Coils, A. St. C. Dunstan; Some Conditions Governing the Deposition of the Lead and Zinc Ores in Southeast Kansas, E. Harworth; Variable Constitution of a Fresh Egg, James Lear and L. E. Sayre; Comparative Chaetotaxy of Diptera, H. W. Menke; Analysis of 'Natural Plaster' from Reno County, L. Page.

NEW BOOKS.

Thirteenth Annual Report of the Bureau of Ethnology. J. W. POWELL. 1891-2. Washington, Government Printing Office. 1896. Pp. lix+462.

Year Book of the United States Department of Agriculture, 1895. Washington, Government Printing Office. 1896. Pp. 656.

Report of Work of Agricultural Experiment Stations of the University of California for the Year 1894-95. Sacramento. 1896. Pp. xii+481.

Lehrbuch der vergleichenden Mikroskopischen Anatomie der Wirbeltiere. ALBERT OPPEL. Erster Teil. Der Magen. Jena, Gustav Fischer. 1896. Pp. viii+543.

Anleitung zur Microchemischen Analyse. H. BEHRENS. Heft III. Hamburg and Leipzig, Leopold Voss. 1896. Pp. vii+135.

Official Year Book of the Scientific and Learned Societies of Great Britain and Ireland. London, Charles Griffin & Co., Ltd. 1896. Pp. iv+262. 7s. 2d.

Long Life. Volume III. C. A. STEPHENS. The Laboratory, Norway Lake, Maine. 1896. Pp. 218.

The Oswego Normal Method of Teaching Geography. AMOS W. FARNHAM. Syracuse, N. Y., C. W. Bardeen. 1896. Pp. 127. 50 cts.

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